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PATENT & TRADEMARK OFFICE

FIG.1

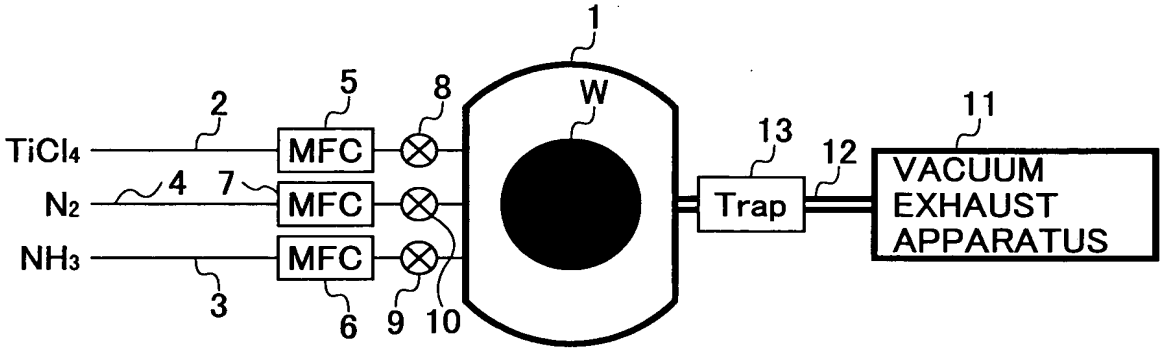


FIG.2

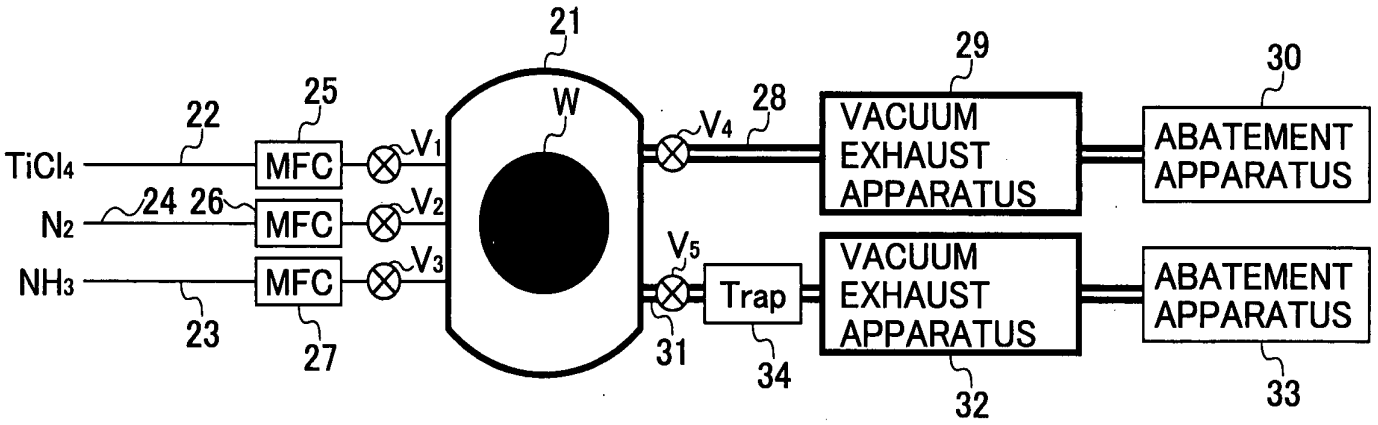

21
W
22
25
29
30
28
TiCl4
MFC
V1
V4
VACUUM EXHAUST APPARATUS
ABATEMENT APPARATUS
24 26
N2
MFC
V2
V5
NH3
MFC
V3
Trap
VACUUM EXHAUST APPARATUS
ABATEMENT APPARATUS
23
27
31
34
32
33

FIG.3

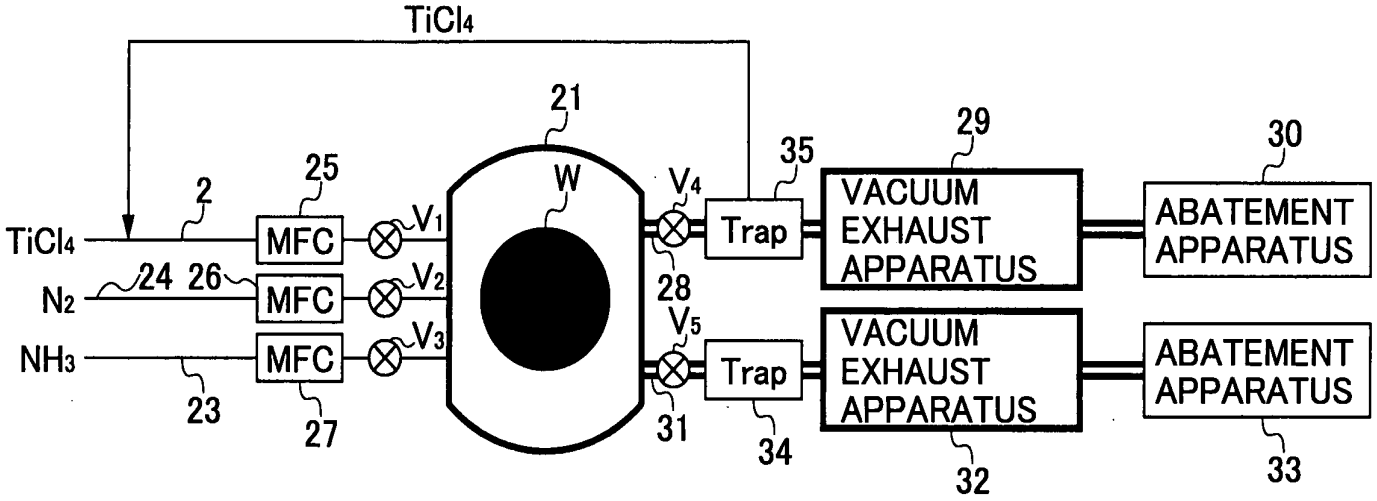

TiCl4
21
W
2
25
35
29
30
TiCl4
MFC
V1
V4
Trap
VACUUM EXHAUST APPARATUS
ABATEMENT APPARATUS
N2
24
26
MFC
V2
28
NH3
MFC
V3
V5
Trap
VACUUM EXHAUST APPARATUS
ABATEMENT APPARATUS
23
27
31
34
32
33

FIG.4

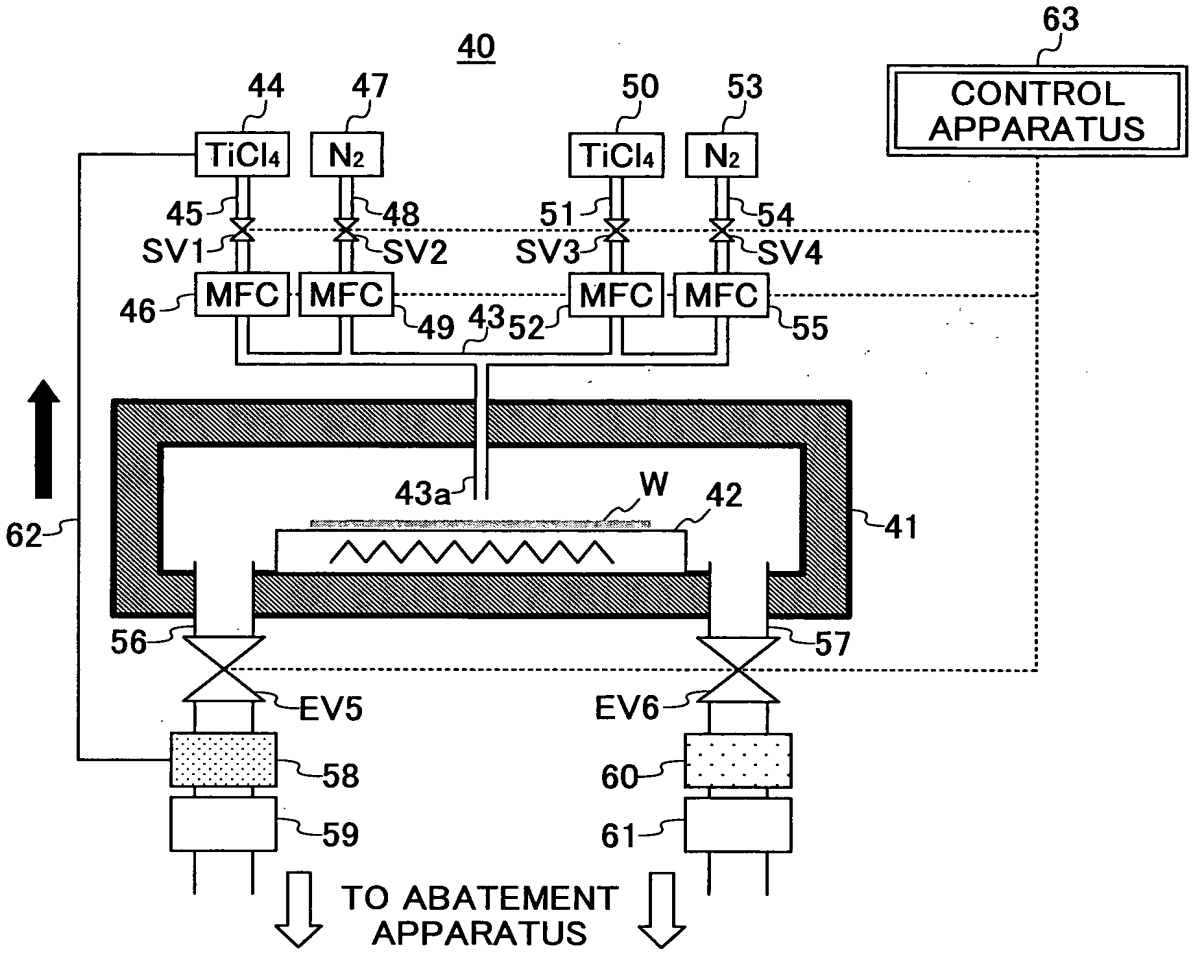

40
63
CONTROL APPARATUS
44
47
50
53
TiCl4
N2
TiCl4
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
MFC
MFC
49
43
52
55
62
43a
W
42
41
56
57
EV5
EV6
58
60
59
61
TO ABATEMENT APPARATUS

FIG.5

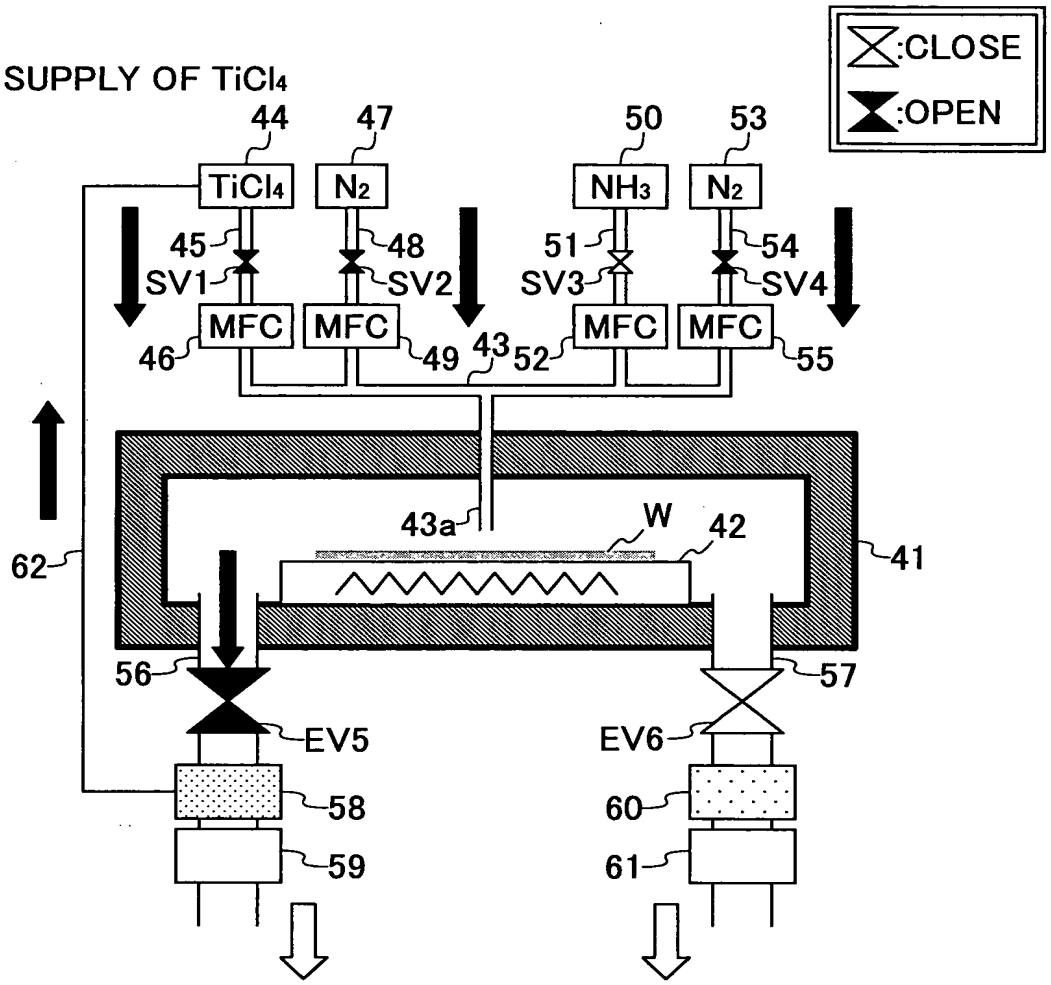

:CLOSE
:OPEN
SUPPLY OF TiCl4
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
MFC
MFC
MFC
MFC
46
49
43
52
55
43a
W
42
41
62
56
57
EV5
EV6
58
60
59
61

FIG.6

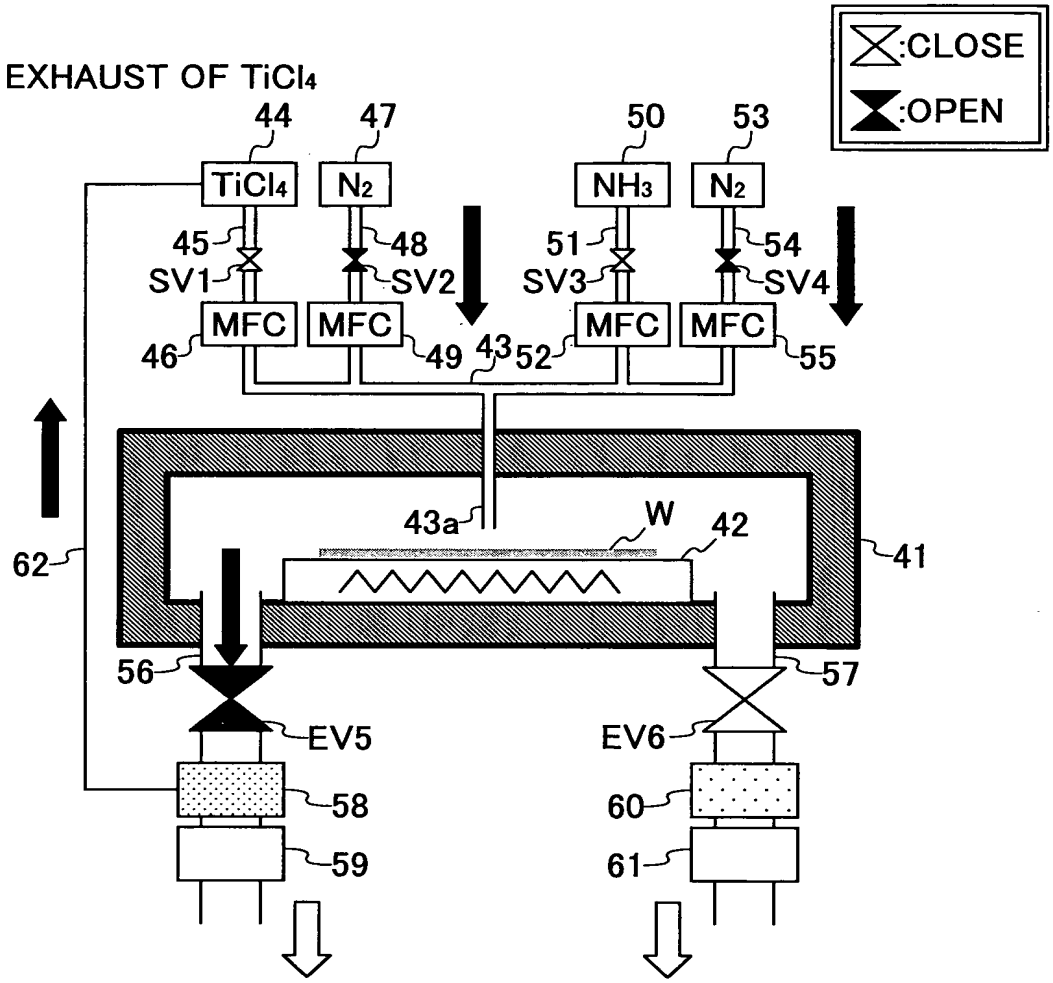

:CLOSE
:OPEN
EXHAUST OF TiCl4
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
MFC
MFC
MFC
MFC
46
49
43
52
55
43a
W
42
41
62
56
57
EV5
EV6
58
60
59
61

FIG.7

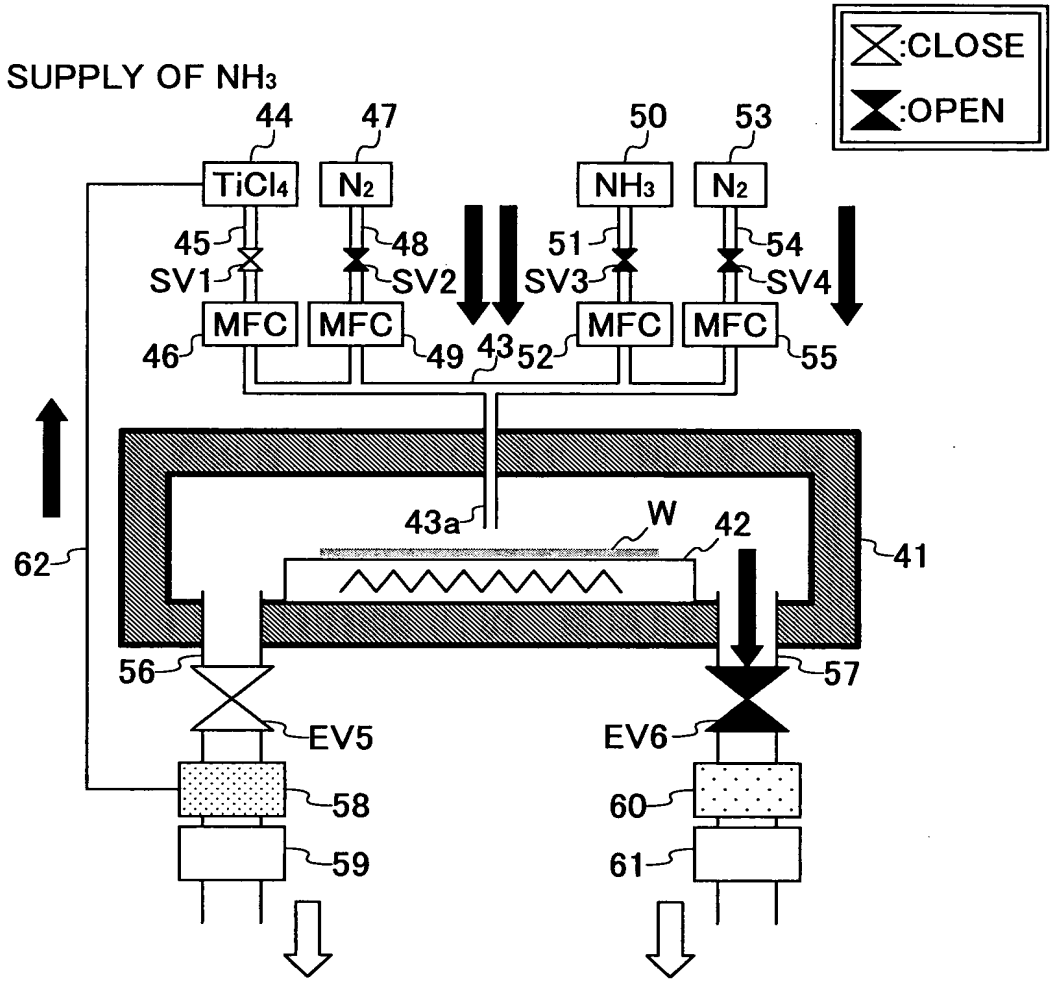

:CLOSE
:OPEN
SUPPLY OF NH3
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
MFC
MFC
MFC
MFC
46
49
43
52
55
62
43a
W
42
41
56
57
EV5
EV6
58
60
59
61

FIG.8

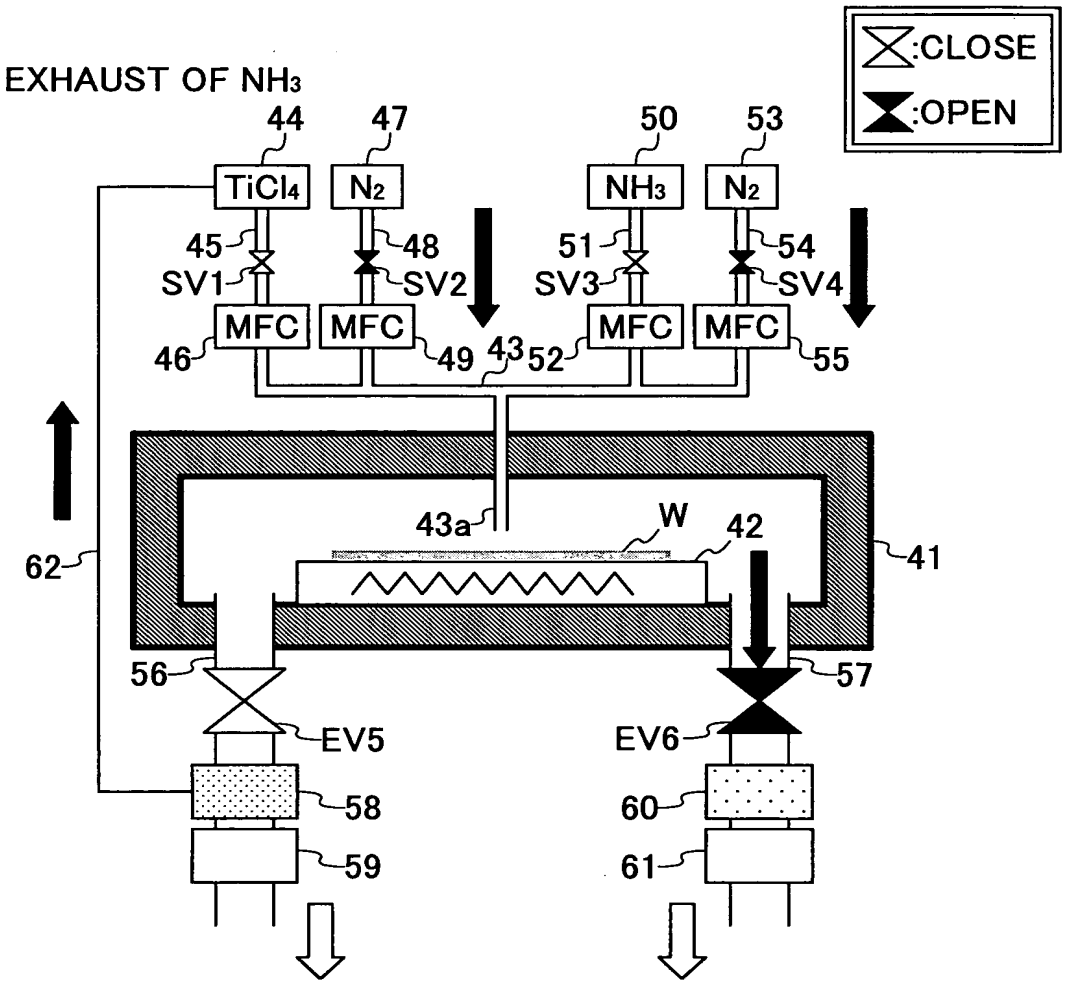

:CLOSE
:OPEN
EXHAUST OF NH3
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
MFC
MFC
MFC
MFC
46
49
43
52
55
62
43a
W
42
41
56
57
EV5
EV6
58
60
59
61

FIG.9

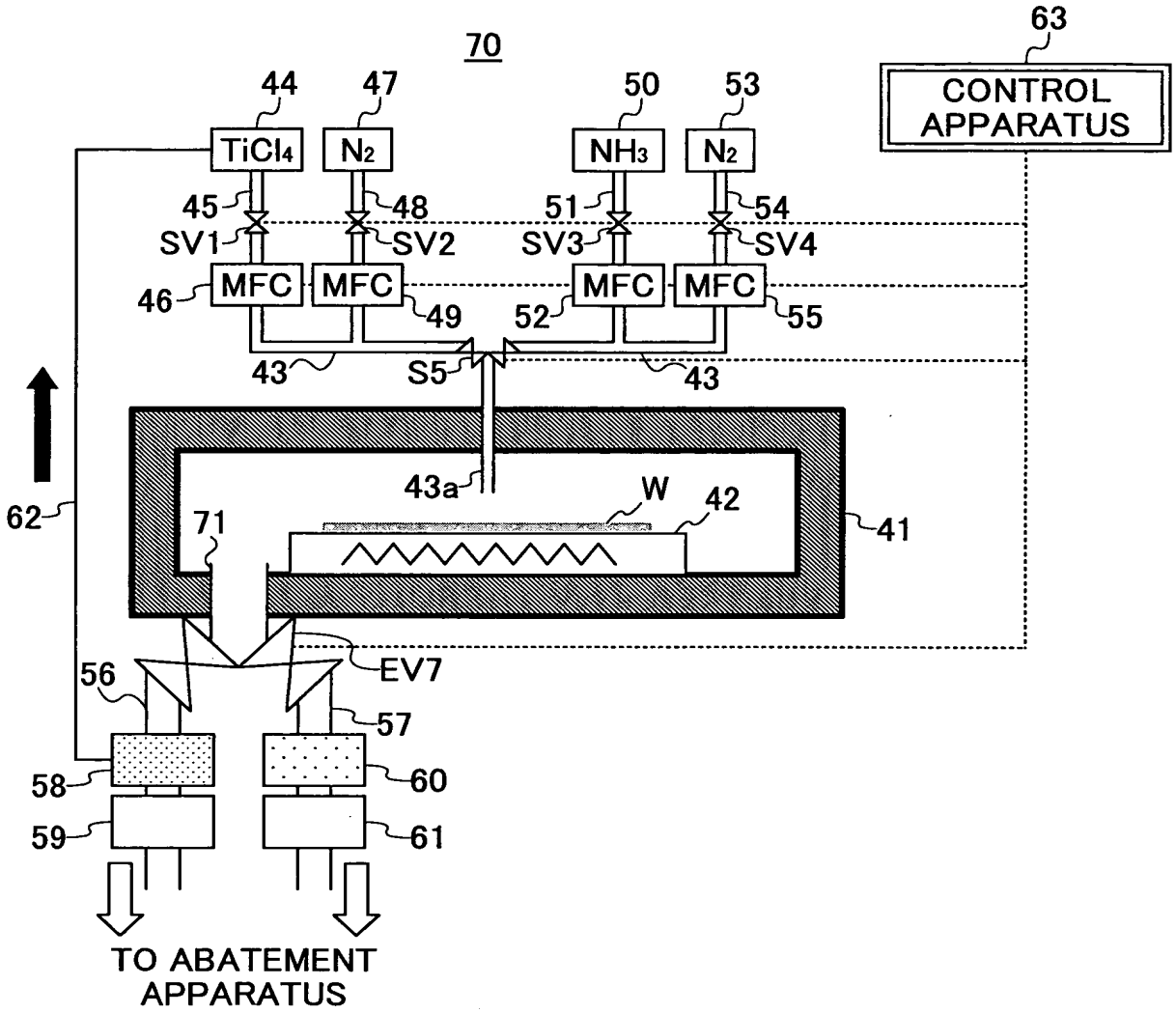

70
63
CONTROL APPARATUS
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
MFC
MFC
49
52
55
43
S5
43
62
43a
W
42
41
71
EV7
56
57
58
60
59
61
TO ABATEMENT APPARATUS

FIG.10

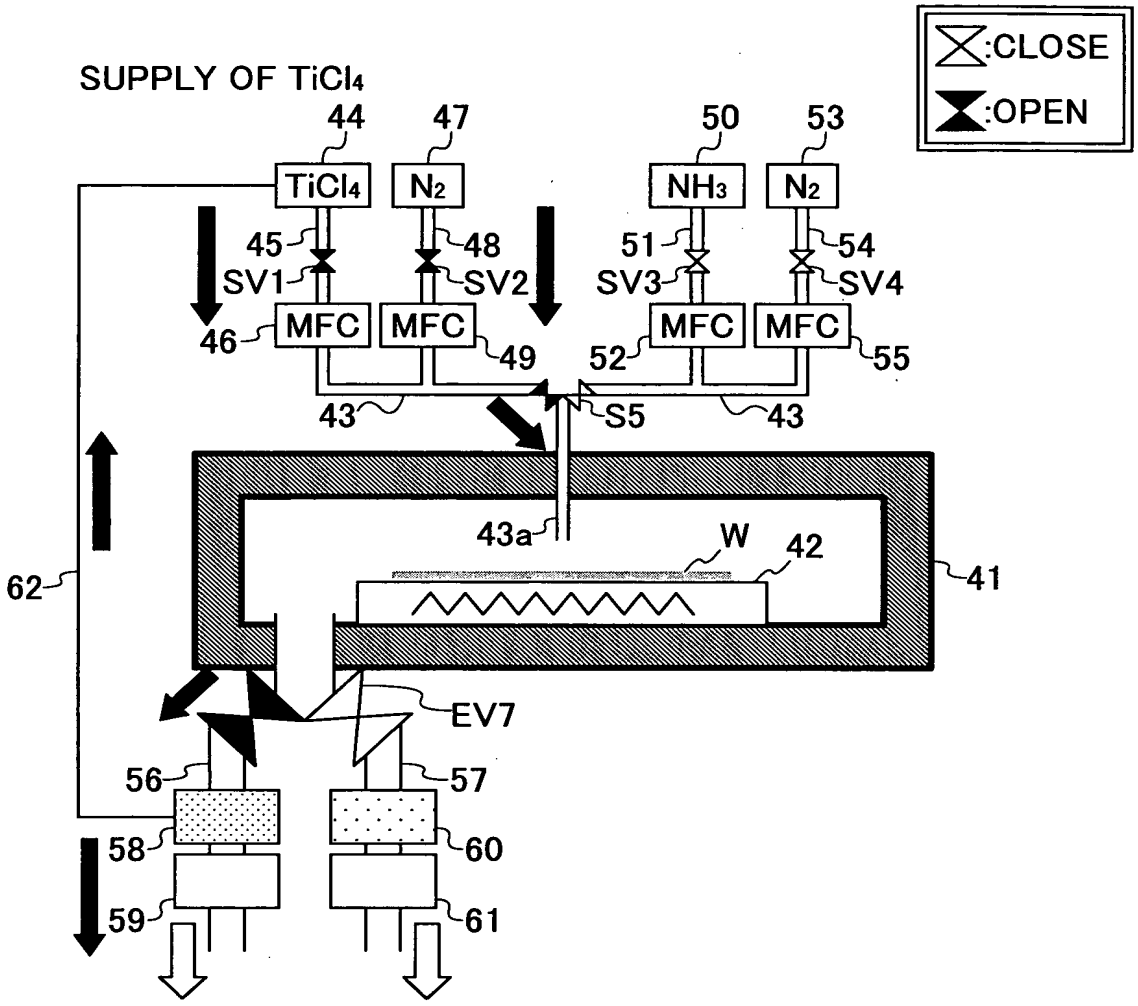

:CLOSE
:OPEN
SUPPLY OF TiCl4
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
49
MFC
MFC
52
55
43
S5
43
43a
W
42
41
62
EV7
56
57
58
60
59
61

FIG.11

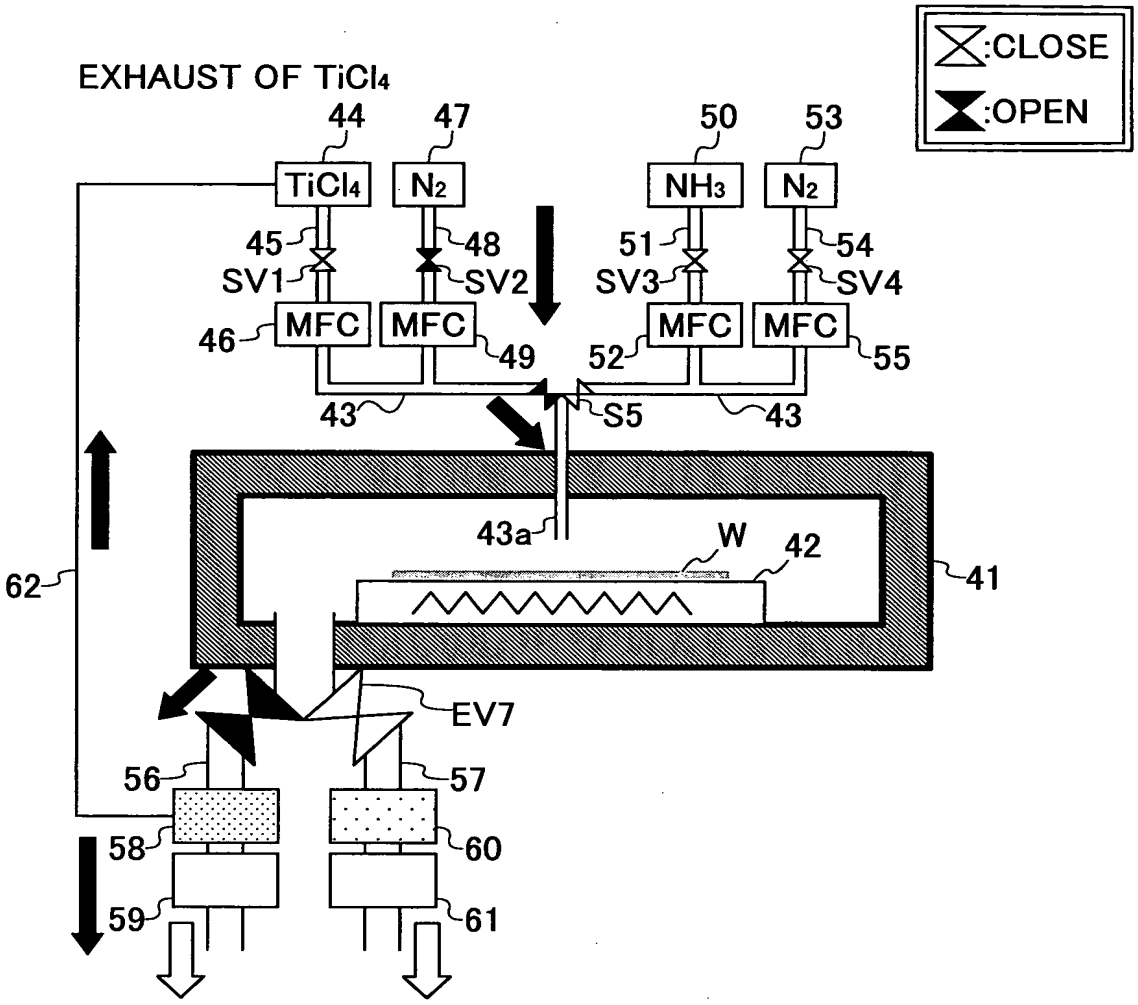

:CLOSE
:OPEN
EXHAUST OF TiCl4
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
MFC
MFC
49
52
55
43
S5
43
43a
W
42
41
62
EV7
56
57
58
60
59
61

FIG.12

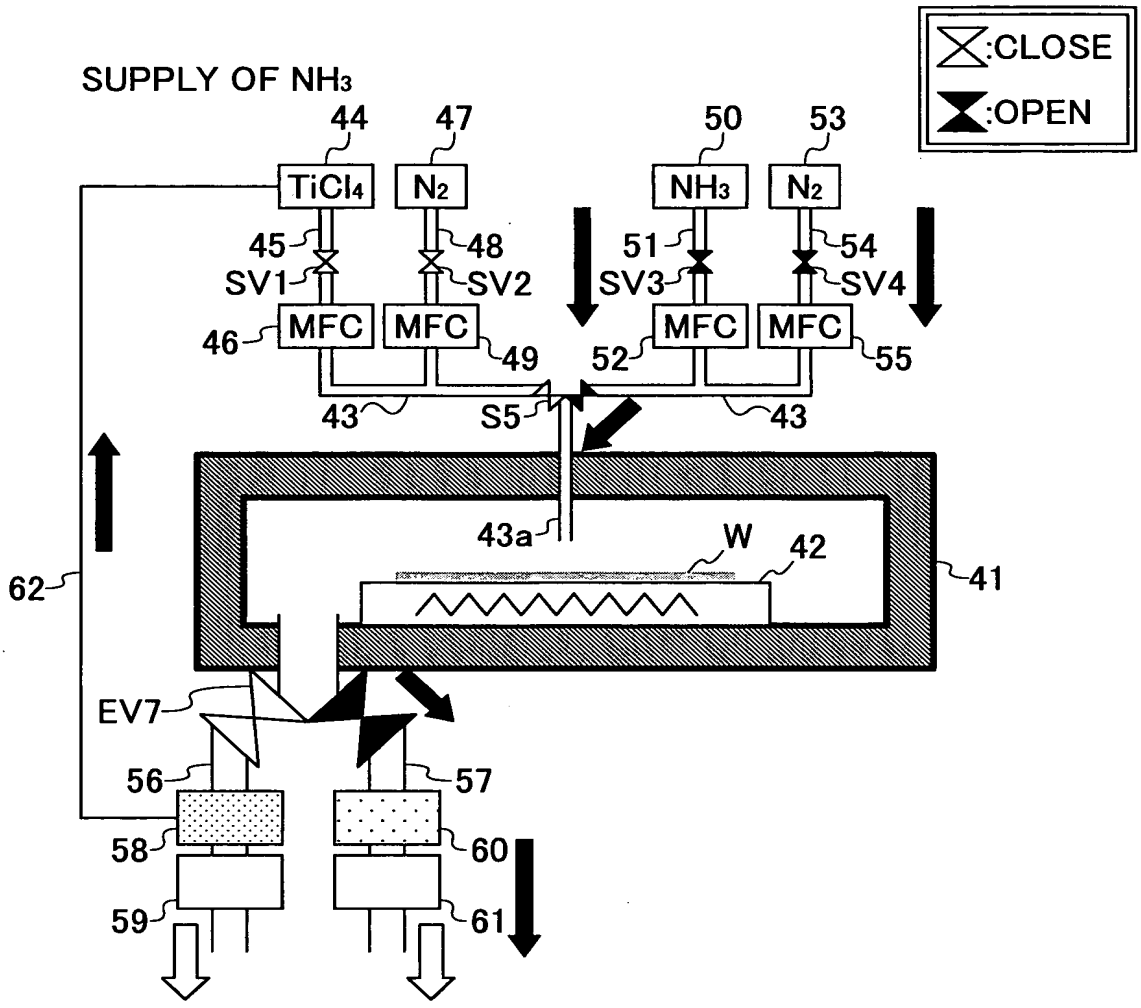

:CLOSE
:OPEN
SUPPLY OF NH3
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
MFC
MFC
49
52
55
43
S5
43
43a
W
42
41
62
EV7
56
57
58
60
59
61

FIG.13

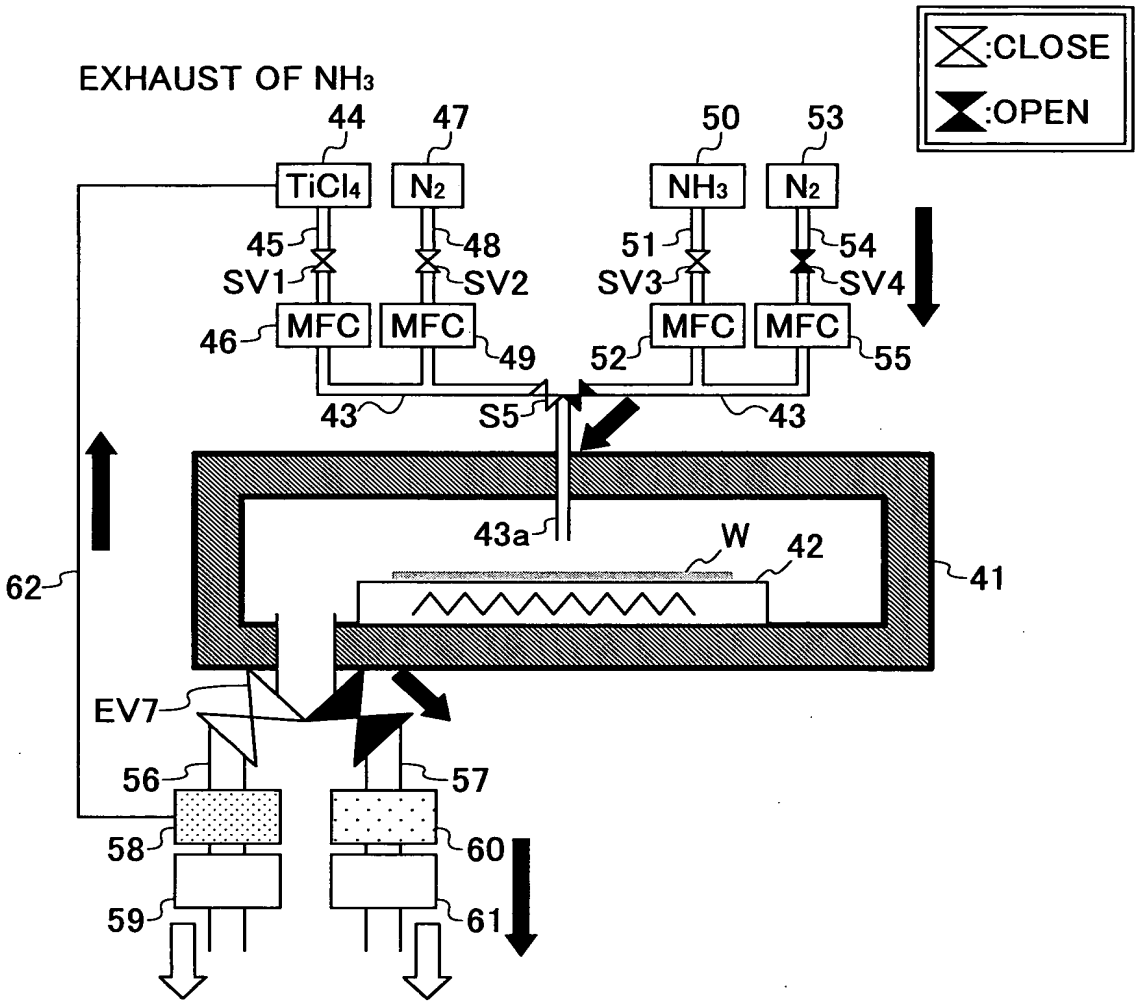

:CLOSE
:OPEN
EXHAUST OF NH3
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
MFC
MFC
MFC
MFC
46
49
52
55
43
S5
43
43a
W
42
41
62
EV7
56
57
58
60
59
61

FIG.14

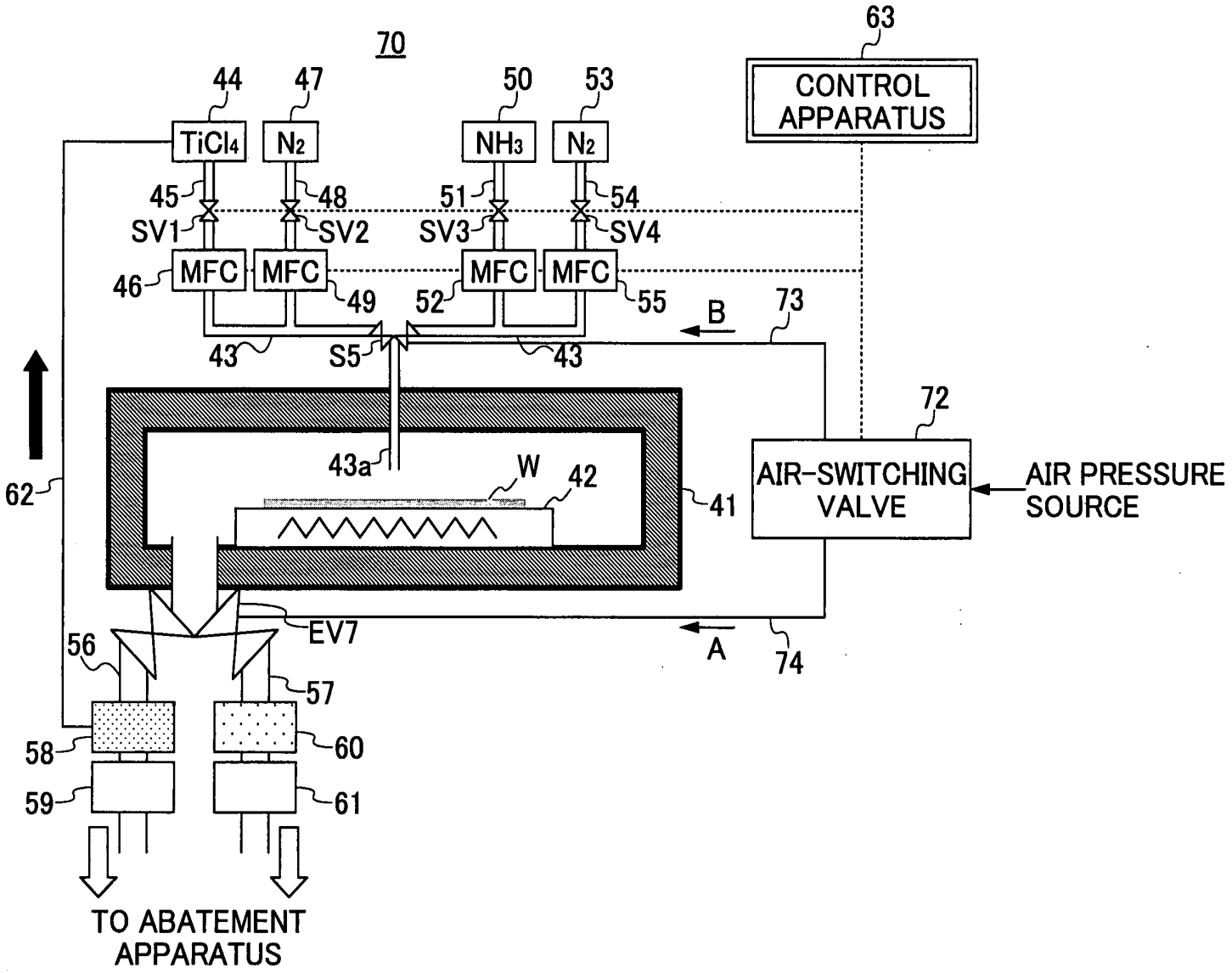
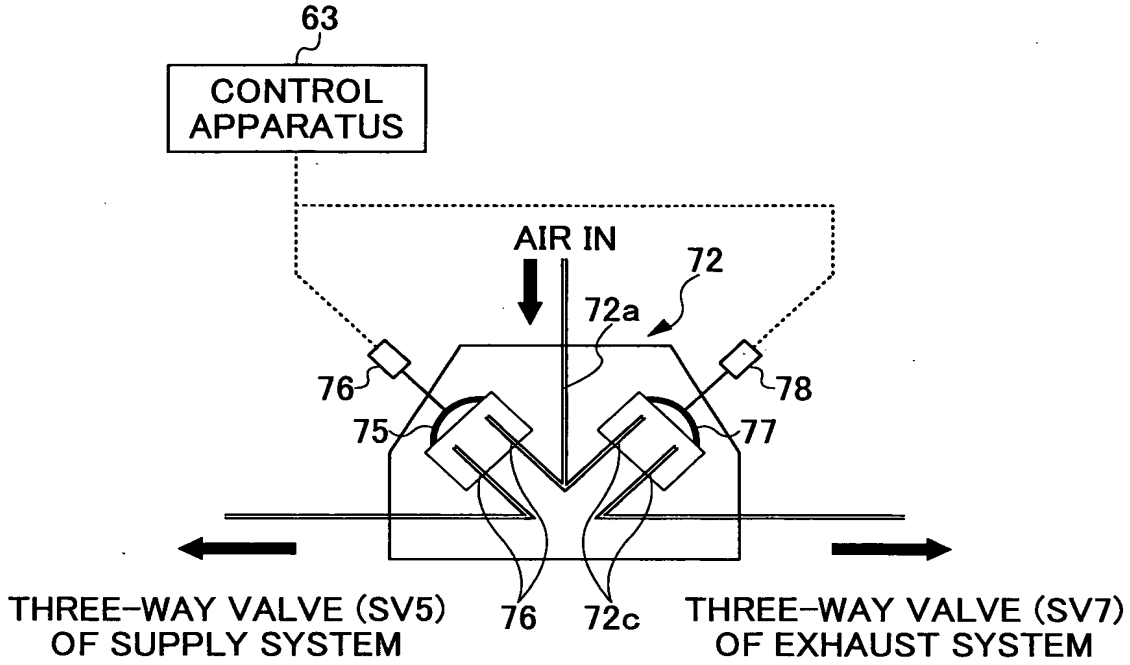

70
63
CONTROL APPARATUS
44
47
50
53
TiCl4
N2
NH3
N2
45
48
51
54
SV1
SV2
SV3
SV4
46
MFC
MFC
MFC
MFC
49
52
55
B
73
43
S5
43
72
43a
W
42
62
41
AIR-SWITCHING VALVE
AIR PRESSURE SOURCE
EV7
A
74
56
57
58
60
59
61
TO ABATEMENT APPARATUS

FIG.15


63
CONTROL APPARATUS
AIR IN
72
72a
76
78
75
77
THREE-WAY VALVE (SV5) OF SUPPLY SYSTEM
76
72c
THREE-WAY VALVE (SV7) OF EXHAUST SYSTEM